THE CAROLINA CHEMIST

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THE CAROLINA CHEMIST has come to be an important part of the machinery of our Department of Chemistry. It is no longer a tyro effort at journalism, a publishing adventure to amuse the boys, but has a distinct mission to fill and is becoming an essential factor in the well-being and success of the Department. Some of its functions may well be mentioned in this, the initial number for the session 1920-21.

In the first place, this publication is for the benefit of the students in the Department, giving them some idea of the scope of the work, the various lines which they may elect to follow, the strength of the organization they have joined and something of what it has done and is achieving in point of service; it also does much to bring about a feeling of comradeship and unity of purpose. This is emphatically their journal.

Secondly, it furnishes a valuable means of keeping up with the alumni, their work in the world, and their successes. The University soon becomes in a way a second home and her sons

who have gone forth to win homes for themselves love to turn back at times and learn what manner of work is going on there and what the other old boys are doing. Alumni personalia should form an important part of the contents of each issue, and to that end the editors appeal to the alumni to write letters back home now and then giving some account as to how they are faring in the big outside. They do not always realize what gratification and pleasure such letters give.

The third object is to aid in making North Carolina a manufacturing State, arousing our people to the possibilities before them and the advantages they enjoy. In this manufacturing development the chemist is destined to play an important part. After a while it will not be necessary for our graduates to seek employment outside the State.

Again, this journal, as distributed among the high schools, will do something to interest prospective students and perhaps cause them to select chemistry as their life work.

These are some of the aims the editors have before them and they are worthy. The call is for every one—student, alumnus, teacher—to do his share in forwarding these aims.

It is indeed deplorable that ample space is not available for the higher courses. This year the number of research students has passed all records of former years and we have been forced to reclaim basement rooms and turn them into research laboratories. And even these rooms are crowded and forced to do double duty. In the research courses, the ones where a man really has a chance to show his ability, and to contribute something of value to the scientific knowledge, is it reasonable to expect him to do his best when he is forced to work in a poorly lighted, poorly ventilated, and poorly equipped room? How long will it take these men at Raleigh who hold our destiny in the palm of their hands to realize that if we are to make the showing that every man and woman in the State would have us make they must provide suitable buildings and equipment with which to make this showing?

Was It Worth While?

By glancing at our alumni directory, or by asking someone questions concerning the men that have spent their four years around the laboratory majoring in Chemistry, we will be informed that in practically every year's graduating class there are a few men who give up Chemistry after leaving college and go into some other kind of work. Some teach, some become farmers, some become automobile of tobacco salesmen, and others follow up various occupations. It is often the case that these men who "go astray" are among the best students in their class, the most diligent workers, and the ones who apparently have the best chance for a success in the Chemical profession.

The men who pursue graduate work in college almost always follow their chosen profession and those who change are the ones who go no further than the bachelor's degree. There are two questions that present themselves in regard to the man who qualifies himself for a position as a chemist and later fails to follow it up. First, why did he give up the profession he selected; and second, was his college training worth while?

The answer to the first question is obviously one peculiar to the individual—every man probably has a different reason for doing this. One may have a better opportunity in some other line of work; another may take the first thing that presents itself; while another may think that he has chosen the wrong profession. We will assume therefore that the majority of the men who change from Chemistry to something else have reasons, to them at least, which are justifiable.

This is not meant to encourage a man to give up his profession for something that, in the immediate future, looks better—far from it; but if he does take up some other occupation let us see if his chemical training was worth while, or, on the other hand, were his four years in the laboratory a waste of time? The average college graduate with an A. B. degree soon forgets a majority of the facts he learned in college. A few years after graduating he remembers nothing, and cares less, of the effect of matrimony upon Milton, the cause and effect of some medieval war, or the conjugation of some irreg-

ular foreign language verb. Not that these things in a man's training are a waste of time, but the writer of this article believes, partly by experience, that scientific facts and the truths of nature will stay with a man longer than those things he studies in getting a liberal education.

A man will not remember a great number of the detailed facts he learns in studying Chemistry, but there will inevitably stick with him a vast number of facts of scientific interest to any one who knows them and which are useful and excellent things in everyday life—and it is a pity that so few people really do know them.

At present science is growing by leaps and bounds. More and more of our daily commodities are results of scientific chemical processes. New inventions that are indeed necessary, and we wonder how we ever got along without them, are a result of chemical processes. New dyes, new explosives, new drugs, new food products, new clothing materials are certainly interesting and useful to everyone; but of greater interest to the man who can at least understand how they are made, what the raw materials and the by-products are.

Considering the broad field which Chemistry now covers, its vast application to everyday life, and besides the fairly broad training a man gets out of his Chemistry course through a concordant selection of outlined minor courses, isn't a major in Chemistry from the aesthetic viewpoint, worth just as much or more to the average non-professional man as a major in arts? He can, with pleasure to himself, talk intelligently about and appreciate the advances of the science and the value of this progress to mankind. He can also, unconsciously, help to bring before the great masses of people a lot of the general facts that people don't, should, and would like to know about.

If the above is true, we can say that the man who majors in Chemistry gets as much out of his course, even if he doesn't follow it up, as the man who majors in some other field, and therefore his time certainly was not wasted.

Chemists! Break into Society!

"Chemists! Break into Society!", a headline from the *Kansan Chemallurgist* suggests a thought worthy of the attention of every student chemist. How many a chemist has felt the isolation of his profession from the public mind! How difficult it is to define chemical engineering for the folks back at home! It is not astonishing that the chemical engineer is thought of as the analyst of alchemic days, or as a sort of apothecary, when there is so little understanding between the public and our profession? We all realize how helpless a chemist feels when attempting to converse with a business man upon a subject which concerns them both. The chemist is willing enough to talk to the man in the street but he has not practised enough. No wonder the ordinary man loses interest when the conversation begins to include the behavior of para-bromphenylsemi—carbazine with ketones, or the constitution of some pyrazolones. The physician can speak of cerebro spinal meningitis, or appendictis and be understood, but the public has not been educated chemically up to the point where it can comprehend our technical terms. A lawyer can lead a jury, ignorant of legal terminology, through a long discussion of points of law, keeping their interest until the case is won. It is a similar thing that the chemist must do if he wishes to gain the attention of the great masses of people. We have an interesting story to tell but we will have to begin by using a simple vocabulary and presenting our technical facts disguised by the description and compared with the every day examples.

Co-Operation With Our Chemical Industries

Since we believe that an active, aggressive, and constructive co-operation between the Department of Chemistry of the University and the chemical industries of North Carolina will tend to speed up the development of the State by stimulating research on industrial problems and by adding to the general store of knowledge of Chemistry, we have asked representatives of the leading industries to express their views in this matter

and you are earnestly requested to make use of this department. Its success depends upon the co-operation of the alumni out in the State. We believe that by this exchange of views and the resulting publicity, active progress will result all the more quickly.

Following is a part of a letter received from Kistler, Lesh, & Company, Morganton, N. C.

"To best serve the industry of the State this department should give special attention to instruction in chemistry involved in the manufacturing processes used in the various industries of the State.

"As tanners and extract manufacturers, we believe the undergraduate courses in this department should instruct the student in the various processes involved in the tanning and finishing of leather, and in the manufacture of tanning extracts. They should become familiar with the analytical methods used for the analysis of fresh and spent barks, wood, tanning extracts, tanning liquors, lime, acids, alkalies, sulphides, oils, fats, greases, waters, and all chemicals and materials used in the tanning operations. They should also be familiar with methods for the complete analysis of leather, and the examination of the various by-products. Instructions should be given in the interpretation of the above mentioned analysis, and also in the preparation of suitable specifications upon which to purchase raw materials.

"There are many problems which might be studied by the graduate branch of this department, for example: The effect of hard water on the leaching of bark, the most efficient blending of tanning extracts, and the effect of various blend upon color, texture, and strength of the resulting leather, studies of finishing processes for leather, and methods for the economic utilization of the waste materials."

In the next issue we hope to run other articles of this type.

Manufacture of Pottery in Catawba County, North Carolina

M. C. YODER

The earthenware, colloquially called stoneware, is made from clay found in that part of the State near certain water courses. The raw clay has a color that varies from light blue, through all the shades of gray, to a light gray. In the manufacture of earthenware this clay must first be ground to make it homogeneous.

The clay mill of the older type consists of a circular pit about three feet deep and two feet in diameter. An upright shaft stands in the center of the pit. This shaft has a number of horizontal knives that cut and stir the clay. On top of the shaft is a long horizontal bar that bends down almost to the ground. To run the mill a horse is hitched to this bar and made to walk in circular path around the pit. At the present time, however, most of the grinding is done in a tube shaped mill about eighteen inches in diameter and five or six feet long, having a shaft through its center, bearing turbine shaped knives that mix the clay and force it through a tube at the same time. The mill sets horizontally and is run by a small engine.

The clay, well ground, is next molded into pots, jars, and jugs. This is all done by hand on a simple machine known as the potters lathe, the principal features of which are an upright shaft bearing at its top a circular table about fifteen inches in diameter—the moulding table—and a large horizontal balance wheel near the ground to insure a steady rotation of the moulding table. The moulder sits in a saddle on a level with the table. A lump of clay, its size depending upon the size of the desired vessel, is stuck to the center of the table by a quick sharp blow. The table is then made to revolve very rapidly. The moulder applies water to the clay; moulding it with his hands by the aid of a small metal plate, called a chip, into the desired product. A great deal of skill is required to mould the pottery upon the rapidly revolving table, and it requires years of practice for a man to develop into a good moulder.

When the article is finished the lathe is stopped and it is cut free from the moulding table by passing a fine wire over the surface of the table. The product, now called "green ware," is placed upon a short board and dried by a slow fire, or in the sun. The drying must not be done too rapidly or the pottery will crack. When it is perfectly dry it is ready to be glazed.

Three different materials are used for glazing the earthenware: red lead, glass, and cinder, or slag from an iron furnace. The glazing material must first be crushed to a powder. This is done in a machine where a pair of steel weights are alternately raised and dropped in a box with an iron bottom. With this crushed material we are now ready to prepare a glazing bath. Clay is added to water and stirred until a liquid is obtained viscuous enough to hold the powdered glazing material in suspension for a short while. The mixture is now wet ground between revolving stones until the suspended matter is reduced to such a degree of fineness that no "grit" can be felt between the fingers on handling it, and it will stand for hours without suspended matter settling out. It is now diluted with water to the proper consistency, and the dried earthenware dipped into it, care being taken that the glazing mixture covers the entire surface of the article both inside and out.

This glazed ware is dried in the sun and is then ready to be burned. The burning is done in a long, low kiln, built of bricks in the form of an arched tunnel. The floor of the kiln is made of difficultly fusible sand. At the end of the kiln is a firing pit about three feet deep and at the other end is a low chimney. A low opening under the chimney gives admittance to the interior of the kiln. The earthenware is set on the sand floor, care being taken that the pots do not touch each other as they will stick together when the glazing runs.

The entrance is now closed and a fire is built in the firing pit. Three holes open into the pit from the outside. Wood is added through these holes and the smoke and flames pass through the kiln, which is built at a slight incline to give a draft, and out the chimney at the other end. The heating is done very slowly until the pottery and the entire inside reaches

a red heat. If the heating is done too rapidly large scales will crack off the outside of the pottery, thereby ruining it. When a red heat is reached the firing is hastened, and the whole interior of the kiln is rapidly raised to a dazzling white heat. This is called blasting. At this point the glazing melts and begins to run slowly down the sides of the vessels. The heating is then slowed down and the temperature is allowed to fall gradually until the kiln is again at red heat. Here the firing is stopped and the pottery allowed to cool. In from thirty-six to forty hours the kiln can be entered and the pottery removed.

The finished product is of a reddish brown color if red lead has been used as a glaze; dark brownish if glazed with iron slag, and grayish white if glazed with glass. The greater part of this earthenware is disposed of on the local markets.

Ceramics

The pottery industry in this State is practically at a standstill, red earthenware and stoneware being the only products. All of the kaolin mined in North Carolina is shipped out of the State. But with the production of feldspar and the abundance of quartz that is available for pottery use there is a good opportunity for pottery establishments to utilize the raw material, such as kaolin and feldspar now being shipped out of the State. The chief clay products are at present common brick, sewer pipes, tile, terra cotta, etc., valued at approximately $2,000,000.

There is also an abundance of fire and pipe clays and shale in the State suitable for the manufacture of all common fire brick, sewer pipe, drain pipe, fancy tile, flue linings, terra cotta, etc. The greater portion of these products are manufactured in Guilford County by the Pomona Terra Cotta Company. A small plant has been recently built in Granville County for the manufacture of fire and face brick, roofing and tile. These producers by no means oversupply the demand however and there is an excellent opportunity for other ceramic industries to enter the field.

The Chemical Inspection Trip

Some time during the fall of 1919 several of the students conceived the idea of holding a chemical inspection trip. This grew out of a desire to see the theoretical principles as taught in the Department applied in the commercial world. The proposition was suggested to the faculty who received it as a thing desired but took no action upon it. Then the students got busy and through the efforts of H. M. Taylor and T. M. Andrews a petition was drawn up and signed by some ten or twelve members of the upper classes and graduate school. This was presented to the faculty and upon receiving its O. K. was next carried to the President. Dr. Chase at once saw the value of such a project and agreed that if a minimum of six men would take the trip the University would pay the expenses of a director. This marked the first accomplishment and gave us something to work upon.

Dr. Bell was appointed official "chaperon" of the party and Taylor got busy upon more definite arrangements. Since none of us were experienced in the details of such a trip there was naturally much room for improvement and now many suggestions can be made that will result in a more efficient trip in the future. These will be found elsewhere in this article.

We are sorry that a report of this trip could not have been made sooner and acknowledgement of our thanks thus expressed to the different companies and other parties who contributed to its success, but due to a shortage of funds THE CHEMIST has not been published since that date.

On April 2nd, Dr. Bell, director, I. W. Smithey and T. M. Andrews, graduate school, H. M. Taylor and D. M. Carroll, seniors, S. C. Ogburn, Jr., junior, H. G. Pickett and C. K. Brooks, sophomores, left the "Hill" making their first stop at Washington, D. C., on the morning of Saturday, April 3rd and visited the chemical laboratories of the Bureau of Standards and the Geo-Physical Laboratories. Sunday was open, the party spending it in different places, Washington, Wilmington, Del., Annapolis, Md., East Orange, N. J., and Philadelphia. At 8:30 A. M., April 5th, the party assembled at headquarters,

Hotel Rittenhouse, Philadelphia, Pa., where they were to stay until the following Saturday.

The first trip in Philadelphia was to the plant of the Atlantic Refining Company in the morning, and to the United Gas Improvement Company's plant in the afternoon. At the conclusion of the inspection of the Atlantic Refining Company's plant we were entertained at luncheon by the chief chemist, Dr. T. G. Delbridge and the assistant chemist, Mr. Giles.

The program for Tuesday provided for a visit to the Biological Laboratories of the H. K. Mulford Company at Glenolden, and to the Barrett Company's plant at Frankford in the afternoon. Again we were treated to a delightful luncheon by Dr. F. E. Stuart and Mr. C. W. Brown of the Mulford Company.

On Wednesday we were shown the plant of the Lee Tire and Rubber Company at Conshohocken, Pa., by Mr. Kearns; and in the afternoon Mr. Donner took us through the Franklin Sugar Refining Company's plant.

Thursday brings us to the Welsbach Company in Gloucester, N. J., where we had the pleasure of running into a Carolina alumnus, Mr. Holland, who very kindly took us through the plant and entertained us to another very nice luncheon. The afternoon was spent at the John T. Lewis & Brothers Company plant.

Friday showed how paper is manufactured by Dill & Collins; and in the afternoon we saw the manufacture of general chemicals at the plant of the DuPont Company.

Saturday marked the close of the trip and Dr. Bell had a hard time getting us away from the United States Industrial Alcohol plant at Curtis Bay, Md.

The above gives the program and a glance at the number of different products, oil, gas, serums, bacterins, coal tar derivatives, rubber, sugar refining, gas mantles, rare earths, paints, paper, and general chemicals such as sulfuric acid, alum, acetic acid, etc., will show how completely the field was covered. It is very evident that much good can be derived from such an inspection and that the boys all received much valuable information as to practical and industrial chemistry. It is hoped

and practically assured that the trip will be made an annual affair if a minimum number of students wish to take it. It is even suggested that we adopt the practice of some of the larger institutions and make it a requirement for graduation.

A few suggestions that will make for a better trip if adopted are the inspection of only one plant a day, or at most only three plants in two days; the limiting of attendance to juniors, seniors and graduate students; the requirement of a written report on each plant, same to be discussed upon a regular class upon the return to the University. If two plants each day are attempted the men become extremely tired out and consequently are not in condition to reap the most benefit, and the trip is often hurried up, thereby missing many of the interesting details. If notes are taken on the inspection and a report written up afterwards one would naturally gain more information and get a clearer idea of the processes.

The welcome given us at each plant only shows how willing the industries are to co-operate with the schools and go a long way towards the success of the trip. While letters have been written to each of the companies expressing our appreciation of their hearty welcome and courtesy which they showed us we wish to thank them again for their co-operation and hope to see them next spring.

Below follows an account of each plant and while it must of necessity be very brief and devoid of detail it will give an idea of what we saw:

THE UNITED STATES BUREAU OF STANDARDS

Department of Chemistry

The chemistry department of the Bureau of Standards is housed in a new and modern building and the arrangement of the laboratories is very interesting. Everything is laid out with an idea of cleanliness and of conserving space. The display cases are all built in the wall, thereby eliminating the "catch alls" for dust, dirt, and trash. Each room is ventilated by blowing filtered air in through distributors and drawing it out through suction tubes. Showers are provided in each laboratory

as a safety device for the men in case of fire and burns. The processes of testing paints, varnishes, rubber, road materials, etc., were of much interest. The approved methods of gas analysis, making of standard steel samples and electroplating also attracted our attention. We were unable to see the electroplating as the men were working on some plates for the Treasury Department. These plates (we were unable to see the denomination) were well guarded by a member of the secret service who sat at the door with a small "gatlin" gun in his hand. In making the steel samples the general specifications are given to the steel manufacturers who furnish the steel in long round bars of approximately six to eight inches in diameter and about four feet in length. This bar is put on a lathe and thoroughly cleaned by grinding off the outer layer. The core is then cut up, sieved, sampled from different portions, analyzed, automatically bottled and is ready for delivery. The recent "shaving" of appropriations for the Department by Congress are very unfortunate as they will result in a reduction of the staff and the closing of several important departments.

THE GEO-PHYSICAL LABORATORIES

Much research on various lines, mainly on minerals, was being carried on at these laboratories. No attempt will be made to make a report upon these as it would require far too much space to do them justice.

THE ATLANTIC REFINING COMPANY

At the Atlantic Refining Company we were very cordially welcomed by Dr. T. G. Delbridge, chief chemist, and a college mate of Dr. Bell's. Mr. Giles, the assistant chemist, conducted us through the plant. This plant is a very large one, covering nine hundred acres and having a daily capacity of sixty-five thousand barrels of refined oil.

It is concerned chiefly with the refining of oil. They operate their own can and barrel factory, turning out 25,000 five-gallon cans, 4,000 barrels, and repairing 2,000 each day. The manufacture of the cans is very interesting, it being an entirely automatic process. The tin is cut, crimped, soldered,

etc., automatically. Their laboratories are well equipped, clean, and modern in every respect. The process is essentially that of condensation in cracking the oils and is very unique. The oil is pumped into the stills, the vapors condense upon the upper portion and fall back upon the hot liquid thereby cracking. Tests are made upon the oil for luminosity, specific gravity, etc. Their crude oil is obtained from all parts of the country, West Virginia, Pennsylvania, Texas, Mexico, and other places; some of it being brought in by steamer, other by pipe lines.

THE UNITED GAS IMPROVEMENT COMPANY

The United Gas Improvement Company supplies the city of Philadelphia with its gas. The sulfuric acid used in purifying the gas is made by them, the lead chamber process being used. The gas furnished is a mixture of water gas and coal gas of twenty-five candle power. The coal gas is of course manufactured by the destructive distillation of coal and the coke resulting therefrom is used in the manufacture of the water gas. The coke is brought from the ovens, hot, and is charged into the furnace where it is heated up by an air blast. At a certain temperature the air is cut off and steam admitted, forming the water gas which then passes to the carburetors. The blast is again turned on the coke and the same process gone through with again. The gas is purified by treating with sulfuric acid and passing over wooden chips soaked in ferric hydroxide. From the purifiers it passes to the resevoirs and out to the city through large meters. Thirty-six million cubic feet are produced daily.

THE H. K. MULFORD COMPANY

We were met at Broad Street station by Mr. C. W. Brown and conducted to the Biological Laboratories of this company. The laboratories, located just outside Philadelphia at Glenolden, are the largest in the world. The original plant covered about fifty acres and now the total is over three hundred. The laboratories are concerned entirely with the production of serums, bacteria antitoxins, etc., and during the war supplied the government with seventy per cent of all the biological products used.

The most impressive thing about these laboratories to the casual observer would be the absolute cleanliness. The lawns are well kept. Separate buildings are provided for each different kind of work. The air in every room is as pure as science can make, the floors and walls are spotless. Everywhere one cannot help but notice the cleanliness.

The horses used are carefully selected, only the ones in the best of health and physical condition being chosen. After purchasing they are kept in "isolation" stables detached from the laboratories and grounds, and are not permitted to enter the grounds or regular stables until they have passed all tests. There is a capacity for more than a thousand horses.

The calves used are bought very young, since young calves are almost always free from tuberculosis. They undergo the same rigid tests as the horses before being treated to form the vaccine and are scrupulously clean.

Numerous tests are applied to their products and they must check up absolutely before being supplied to the trade. In one room there was a supply of antitoxin valued at one million dollars. This gives some idea as to the enormous production.

The filters used in purifying serums are porous cones, the pores being smaller than the smallest bacteria. The substance to be filtered is forced through these cones under a pressure of several hundred pounds. All containers, needles, rubber stoppers, tubes, etc. are wrapped and sterilized in mammoth steam pressure sterilizers at a temperature of 200 degrees centigrade for four hours. After complete sterilization the serums and containers go to the filling room where only employees in sterilized uniforms are allowed.

In addition to the biological products the Mulford Company makes its own glass containers, tubes, bottles, and syringes; turning out around one million articles monthly.

While the Mulford Laboratories are more in the line of Biological chemistry than of Industrial chemistry it would be a great mistake to leave such a plant from the schedule, as the immense scale upon which the work is carried on, the absolute cleanliness, and the work which it is doing for humanity leaves

an impression which can never be forgotten and which is bound to have its effect.

THE BARRETT COMPANY

The Frankford plant of the Barrett Company is essentially a refining plant, their products being mostly naphthalene, phenol, xylol, benzol, anthracene, cresote, Cumar resin, alpha naphthylamine, etc. The principal process is that of fractional distillation, the plant having an equipment of thirty-five column stills varying from 1,200 to 10,000 gallons.

In the distillation of coal tar several fractions are cut. The first cut obtained is known as light oil and contains all of the benzol, toluol, and xylol, some of the tar acids, pyridine bases, and naphthalene. The second fraction, or carbolic oil, contains almost all of the naphthalene and tar acids, and the bulk of the pyridine bases. The fraction following this is known as creosote oil and is used largely for creosoting purposes. The fourth fraction gives the crude anthracene.

The Chemical department takes, as its crudes, light and carbolic oil from several of the other Barrett plants, crude napthalene, crude carbolic acids and crude anthracene. The light oil still consists of a battery of fire heated fractionating stills equipped to run under vacuum. The distilled naphtha containing oils from the light oil stills is allowed to cool in large shallow pans. Here the bulk of the naphthalene crystallizes out and is separated from the oil by draining and centrifuging.

The benzol house consists of a battery of column stills heated by steam and run without vacuum. This plant receives the crude benzol and toluol fractions of the light oil stills together with some of the closer boiling light crudes. The crude fractions are first washed with sulfuric acid in order to remove the unsaturated compounds. The materials are then washed with caustic soda in order to remove the sulfuric acid and are then charged into the stills. These stills produce pure benzol, toluol and the intermediate fractions which are redistilled.

The Cumar plant contains three distinct operations, the first being to treat the naphthalene free oils for the removal of tar acids and pyridine bases. The tar acids are extracted with

caustic soda and the pyridine bases with dilute sulfuric acid. In the second operation the coumarone and indene fractions are treated to produce solvent naphtha, hi-flash naphtha, and "cumar" resin. The third operation is the manufacture of emulsifying disinfectants. These products consist of a coal tar, a soap, tar acids and water.

In the freezing plant the last traces of naphthalene from the naphthalene containing oils after the extraction in the Cumar plant are removed. The oils are run into brine jacketed agitators and are cooled down to a temperature of about minus twenty degrees; the separated naphthalene being subsequently removed by running the oil through a centrifugal separator.

The crude napthalene is melted up in a tank, run into large shallow pans and allowed to cool slowly. The crude naphthalene obtained here is subjected to a whizzing treatment and is finally washed with warm water in order to complete the removal of the oil. The purified naphthalene is charged into fire heated simple stills and subjected to distillation. The middle fraction of the distillate is charged, molten, into lead lined agitators with sulfuric acid, thereby freeing the naphthalene of unsaturated compounds. It is then washed with caustic soda solution and subjected to redistillation. The middle fraction of this redistillation is run into shallow pans and allowed to solidify. Some of this is used for subliming.

In the flake house the refined distilled product is charged into deep pans situated at one end of the house and heated by steam coils. The naphthalene sublimes from these into large rooms where it condenses as a flake. After this process it is shoveled up and packed. Part of the distilled product is broken from the pans where it has solidified and is shipped as such, while part of it is run into the ball machine and other special moulding machines.

THE LEE TIRE AND RUBBER COMPANY

The Lee Tire and Rubber Company has a capacity of 500 tires per day and demonstrates nicely the working of crude rubber into the finished product. It is received in bales, cleaned,

ground up, and mixed with the various fillers so as to make the working of it easy. It is run out into large sheets, cut to the proper size, and made into tires. Their specialty is a puncture proof tire which is nothing more than three layers of steel discs worked into the fabric of the tire. Numerous tests such as plasticity, tensile strength, durability, etc. are made upon the rubber.

THE FRANKLIN SUGAR REFINING COMPANY

This plant uses raw Cuban sugar and has a capacity of 3,200,000 pounds daily. The raw sugar carries a lot of syrup, trash, etc., and is first washed and centrifuged thereby removing most of the impurities. From here the process separates into two parallel ones, the first being the treatment of the crystals and the second the treatment of the syrup and the wash liquors. The crystals are dissolved and run through a filter press, thence to huge bone black filters which decolorizes the sugar. This product is run into evaporators and evaporated under a pressure of five inches of mercury until it crystallizes to a mush. This mush is run into centrifuges, washed with water and then dried. From the driers it is carried to the packing room where it is automatically weighed out.

In the process of treating the syrup it is first filtered through bags and then combined with the wash water from the crystals, bags, bone black filters, etc., and the whole again run through the bone black filter. From then on it undergoes the same process as the solution of the crystals. Much of the sugar is moulded into blocks making the famous "Domino" sugar.

THE WELSBACH COMPANY

The Welsbach Company is concerned chiefly with the production of gas mantles and rare earths. The rare earths are obtained from the Monazite sands of North Carolina, Virginia, and Brazil. The latter are largely used since they carry a larger per cent of thorium.

The sands are treated with sulfuric acid and are finally changed into the nitrate in which form it is applied to the

mantle. In making the mantle a base is required to place the solution of the rare earth upon. This solution consists of approximately 99 per cent thorium nitrate and 1 per cent cerium nitrate. The base for the solution is made of a gauze knitted from a very high grade fiber. The gauze is thoroughly cleaned, dried, treated with the rare earth solution and redried. The gauze is then cut into the proper length for the mantle and treated with a fixing solution at one end in order to give it sufficient strength to hold the clay ring. This is put on and the other end of the mantle tied. The whole is then put on frames and run through a hardening solution. From this solution the mantle is carried to the automatic burners where the cellulose gauze is burned out leaving the shell of rare earth. This is far too fragile to stand handling, packing, shipping, etc. so it is dipped in a collodion solution and dried. Each mantle is inspected and packed and is now ready for shipment. From 75 to 80 per cent of the alcohol and about 25 per cent of the camphor used in the collodion solution is recovered. The plant uses twenty-five miles of fiber per day for making the base and turns out 100,000 mantles per day.

DILL & COLLINS COMPANY

Dill & Collins are large manufacturers of paper. No attempt will be made to describe their process of manufacture as an article by Dr. A. S. Wheeler upon the manufacture of paper was published in a former number of THE CHEMIST.

E. I. DUPONT DE NEMOURS COMPANY

This plant is located at 3500 Gray's Ferry Road and manufactures a large line of paints and general chemicals. Here as at the Lewis plant white lead is an important product and the duPont Company uses both the Old Dutch and the Carter Process and the final product is a mixture of both.

Sulfuric acid is made by the contact process and both supplied to the trade and used in the manufacture of alum.

Alum is made from Bauxite, this being obtained from Georgia. The bauxite is digested with sulfuric acid, filtered,

treated with the requisite amount of alkali sulphate, concentrated and allowed to crystallize. The plant also manufactures acetic acid.

JOHN T. LEWIS AND BROTHERS COMPANY

John T. Lewis and Brothers Company are manufacturers of paints, both mixed and unmixed, and dry colors. Their chief product is the famous "Dutch Boy" white lead which is made by the Old Dutch process.

The lead comes in large blocks weighing 80 pounds and is melted and moulded into plates with holes in them to allow a good circulation of the gases. These forms are charged into clay pots along with the necessary amount of acetic acid and the stacks are built up. First a fourteen-inch layer of tan bark, then the pots, a wooden covering, another layer of tan bark and so on until the stacks are completed. The process requires about 100 days and when complete the lead carbonate is ground, sieved, washed, dried and sold dry or mixed ready for use.

The company is very careful as to the welfare of their employees and takes every precaution to prevent lead poisoning. It provides uniforms, medical aid, etc.

THE UNITED STATES INDUSTRIAL ALCOHOL COMPANY

The United States Industrial Alcohol Company's plant is located at Curtis Bay, Maryland, and has a daily capacity of 100,000 gallons of alcohol. During the war they made 60 per cent of the supply.

The process is that of fermentation of molasses. The common "Black Strap" molasses is brought from Cuba in the company's own steamers and about 210,000 gallons are used daily. The molasses is pumped from the steamers into the storage tanks; from which it runs to the mixing tanks where it is mixed with four parts of water, and 60 gallons of sulfuric acid for every 130,000 gallons of molasses mixture is added.

This mixture is then run into the fermentation tanks; which are built of sheet iron, are of 140,000 gallons capacity and fifteen in number. The tops are closed in order to catch the carbon dioxide which is washed, liquefied and sold.

The yeast culture is started on Agar Agar and is gradually built up to 50 or 75 gallons of very concentrated yeast mixture. This is added to the fermentation tanks and the whole allowed to ferment. About six days is required for the fermentation. The fermented liquor is then carried to the stills where it yields a 95 per cent alcohol.

The entire plant is carefully watched over by government officials and everywhere the government lock is evident. The company pays a federal tax of $750,000 each month.

One would very naturally expect a very dirty and sticky plant but such is not the case. It is very clean, neat, and ideal in every respect.

Research in the Department

This year the number of men doing research is much larger than ever before. The problems concerned have a wide range, both practical and purely scientific and it is confidently hoped that much is going to be accomplished. The organic field has made the largest bid, especially among the graduate school, but each department has its full quota of enthusiastic adherents.

The following men are taking their research in Organic Chemistry under Dr. A. S. Wheeler:

I. W. Smithey is continuing his work of the previous year on the bromination products of 2-aminocymene.

T. M. Andrews is engaged in the preparation of new bromine derivatives of Juglone. This includes a new case of tautomerism.

I. V. Giles is also working on the amino derivatives of cymene, namely the chloronation products of 2-aminocymene.

S. C. Smith is having much success with a new type of ethers. These are obtained by the action of alcohols upon the addition products of chloral with nitroanilines.

H. M. Taylor is continuing his work on the residual Kelp Oils. This oil is a by-product of the potash industry of California.

P. R. Dawson is making a study of the chlorination of Juglone. A new series of dyes will be investigated in this problem.

A. M. Wolfson is engaged in making a condensation of Vanillin with Di-chlor-aniline.

Dr. F. P. Venable is directing the work of the following men in the Inorganic field:

R. O. Dietz is studying the reaction between methane and zirconium tetrachloride.

L. M. Nelson is working on the dehydration of zirconium sulphate.

H. L. Caviness is preparing ferro and ferri-cyanides of zirconium.

Dr. J. M. Bell has charge of the following men in Physical Chemistry:

The extent of the lowering of the freezing point of a compound by other compounds is theoreticaly given by a formula involving the latent heat of fusion. In order to test this point, the heats of fusion of various nitro-toluenes is desired. This problem is being investigated by C. R. Harris and Bingham Owens.

D. M. Carroll is testing the efficiency of the nitration of toluol and its nitro compounds.

B. Naiman is making a study of the arsenates of sodium,

The arsenates of potassium are being studied by J. W. Guard.

C. B. Ridge is determining the solubility of zirconium oxy-chloride in hydrochloric acid solutions.

Dr. J. T. Dobbins has the following men under him:

S. C. Ogburn Jr. is engaged in the preparation of inorganic cobaltinitrites, their analyses, and the application to quantitative analysis.

N. W. Taylor is preparing some complex cyanides of cobalt and trying to find a method of analysis for these and previously prepared compounds of this character.

F. P. Brooks is engaged in the production of thymol from cymene by a new and shorter synthesis.

Library Troubles

The receipt of the current foreign journals is again becoming quite regular and prompt. Frequently the journals arrive in Chapel Hill in less than three weeks after the printed date of publication. The disturbed condition of exchange is a source of considerable trouble. It may be of interest to indicate the devices which the German publishers use in an attempt to overcome the adverse exchange. Some have frankly printed the price of subscription to foreigners. Thus the "Zeitschrift fur anorganische Chemie" costs foreigners 100 marks, as against the old rate of 15 marks. To every printed quotation there is added twenty per cent as well as the cost of wrapping, postage and nearly always registration. Other journals adopt a different plan, that of adding a percentage (fixed monthly by a publishers association) to all bills. This percentage was as high as 590 per cent but has now dropped to 170 per cent. Thus a book listed at 10 marks costs a German 12 marks, but with the 170 per cent and 20 per cent additional costs an American 32.4 marks. The value of a mark has, however, declined to such an extent that bills for 50, 100, or even 500 marks have no great terrors. Thus a ten mark book, which at the normal rate of exchange costs less than fifty cents, with exchange as it now is. (Novemebr 15.) Second hand books may be obtained at 20 per cent above list prices without the additional 170 per cent.

The library of the department still lacks parts of the German journals of the 1917-1918 period and numerous attempts to obtain the missing numbers have resulted in success in several instances. It is probable that several years more will intervene before all the sets are completed.

Sigma XI

Last Spring a chapter of the Society of Sigma XI. was granted to the University with Dr. J. H. Pratt, Dr. J. M. Bell, Dr. A. S. Wheeler, Dr. F. P. Venable, Dr. W. B. McNider, Dr. H. V. P. Wilson, Major Wm. Cain and Dr. W. C. Coker as

charter members. This is a signal recognition of the scientific departments of the University.

The following men have been elected to active membership: Dr. W. F. Prouty, Dr. J. F. Dashiell, Mr. T. F. Hickerson.

Messrs. I. W. Smithey, T. M. Andrews, I. V. Giles, B. Markham, H. R. Totten, J. N. Couch, S. C. Smith, and J. L. Stuckey were elected to associate membership. Dr. C. H. Herty was elected to this chapter as a non-resident member. Dr. J. W. Lasley, and Dr. Otto Stuhlman, members of Sigma XI at University of Chicago and University of Pennsylvania, respectively, became affiliated with this chapter.

Alpha Chi Sigma

Alpha Chi Sigma began the year with eleven alchemists and one pledge, E. D. Jennings. We were fortunate to keep our hall this year, in spite of the shortage of houses and we are always glad to have an old Carolina man drop around and pay us a visit. Some of the men who have visited us this fall are J. P. Sawyer, '18, H. G. Smith, '19, H. L. Crook, and F. R. Weaver, '13. We have had several enjoyable entertainments this fall and hope to have several more during the course of the year. On Thursday, November 18th, we held a feed for the honor of the upperclassmen and had some fifteen or twenty present. The gist of it all is that we are looking for a most pleasant and profitable year.

The Journal Club

Since the last issue of THE CHEMIST there have been eight meetings held and the following papers were presented:

"Improved Determination of Calcium" by B. Naiman.

"Activities of Carbon" by R. O. Dietz.

"Potash in America" by R. H. Souther.

"Synthetic Rubber" by S. C. Smith.

"Copper Flame Test for the Halogens" by M. C. Yoder.

"Subacetate and Subsulphate of Lead" by S. C. Smith.

"Oxygen Content of the Upper Atmosphere" by W. White.

"Organic Chemical Reagents" by S. S. Jenkins.

"Sugar Syrup from Sugar Beets" by J. W. Guard.

"Lipolytic Enzymes in Olive Oil" by F. H. Spry.

"Alkali Fusion of Sulfonic Acids" by T. M. Andrews.

"The Recent Inspection Trip and Its Advantages" by Dr. Bell.

"The Welsbach Mantle Plant of Gloucester, N. J." by H. M. Taylor.

"The Industrial Alcohol Plant of Baltimore" by T. M. Andrews.

"The Franklin Sugar Refinery, Philadelphia" by I. W. Smithey.

"The United Gas Improvement Company, Philadelphia," by D. M. Carroll.

"Lewis Brothers Paint Company" by S. C. Ogburn, Jr.

"New Complex Ethers Made from Alcohols, Chloral, and Nitroaniline" by S. C. Smith.

"Solubilities of Acids in Cymene" by H. M. Taylor.

"An Investigation of the Kelp Oils" by H. M. Taylor.

"Derivatives of Juglone" by T. M. Andrews.

"Potash and its Manufacture from the Kelp Plant" by Dr. J. W. Turrentine of California.

From the above papers one can see the very varied program and the immense benefit to be gained by the students from such discussions in the Journal Club.

The Annual Chem Feed

In accordance with their annual custom the U. N. C. Chemists gathered around the festive board in Chemistry Hall, on Monday night, October 11th, for the celebration of one of the most important events of the year, the Chem Feed. This feed is an affair, unique in the department, which creates a greater spirit of co-operation among the faculty and students, and affords a means through which the embryo chemists may become acquainted with the older men.

Mr. I. W. Smithey, presiding over the occasion, introduced the speakers, the first of whom was Dr. Venable. He stressed the spirit of the department, adding that the old men became so attached to the place as to regard it as their home. He also announced the winner of the medal that was offered last year by THE CAROLINA CHEMIST to the high school student in the State making the highest grade on an examination given by the department, with the further condition that he enter the University in the following year. The first recipient of this medal was Mr. Winbourne Thompson, of Winston-Salem High School.

Following Dr. Venable, Dr. Wheeler gave an interesting talk on The American Chemical Society, giving in detail an account of the fall meeting held in Chicago.

Probably the most interesting speech of the occasion was that of Dr. Bell's when he told the young chemists the kinds of work they would come in contact with after leaving college. He divided the work into four classes: viz., governmental work, straight industrial work, pure scientific research and teaching.

Speaking for the students, Mr. R. O. Dietz, senior student, urged a greater spirit of co-operation among the students. "I have always admired the students of the medical school for their fraternal spirit" he said, "and I think that we could do no better than to pattern from them in this respect."

Mr. H. M. Taylor presented the aims and purposes of THE CAROLINA CHEMIST for this year, he being the newly elected editor-in-chief.

Quite a store of knowledge was then gained by the audience when Mr. Giles read the mysterious results of his research in the quiz books of some two hundred and fifty freshmen in Chemistry I.

But long before now the hungry gazes had begun to fall upon the laden table before us, so attention was turned to the feed. This was quite elaborate evidencing much thought and work by the feed committee and perhaps a few hours lost sleep by the finance committee. Soon we all retired to our rooms looking forward to the same occasion one year hence.

Alumni Notes

H. G. Smith has resigned his position with the Buckeye Cottonseed Oil Company and is now Instructor of Chemistry at North Carolina State College.

Woodford White is Assistant Professor of Chemistry at Clemson College, South Carolina.

F. H. Spry is teaching chemistry in Back Bay high school, Back Bay, Va.

E. B. Cordon has accepted a position with Pratt and Lambert Paint and Varnish Company of Buffalo, N. Y.

R. H. Souther is with the Proximity Mills of Greensboro, N. C.

H. L. Crook has accepted a position as food chemist with the Department of Agriculture, Raleigh, N. C.

B. L. Meredith has been transferred from the Wilmington, Del., plant of the du Pont Company to their plant in Iquique, South America.

F. R. Weaver, formerly with the Western Cartridge Company, Springfield, Ill., and the U. S. Expeditionary Forces, has accepted a position as pyrotechnical chemist, Edgewood Arsenal, Edgewood, Md.

Dr. Wheeler visited his parents in Tacoma, Washington, during the summer, coming back by Chicago for the meeting of the American Chemical Society and New York for the Chemical Exposition.

Dr. Bell made a trip to Toronto, Canada, and the meeting of the American Chemical Society during the latter part of the summer.

Dr. Dobbins spent the summer with his parents at Booneville, N. C.

Among the visitors on the Hill this fall were, F. R. Weaver, J. P. Sawyer, O. K. Merritt, H. L. Crook, Dr. C. S. Venable and wife. Dr. Venable was married to Miss Bartlett of Danielson, Conn., on September 18, 1920.

N. A. Reasoner was married to Miss Dorothy Elizabeth Chambers of Bradentown, Fla., on November 10, 1920.

To the alumni we have a plea to make both financially and otherwise. THE CHEMIST has made its place among the publications of the University and it is too valuable to you to allow it to fall by the wayside just as it is beginning to be quoted by the leading newspapers of the State and is being given a place of authority along its lines. If given the opportunity there is no end to the work that it can do. But it takes money to accomplish these things. Advertisers bear a large part of the expense but even they can't pay all the bills. It is a hard task to make both ends meet and the business managers have just cause to lose sleep over financial conditions.

THE CHEMIST is sent to every alumnus of the Department. It is your magazine and you must bear your end of the load. Don't expect the undergraduate to bear it all. Many of you have back subscriptions that are overdue. You have gladly received and enjoyed copies from the Department but only a few of you have thought to send a check to cover even the cost of mailing. In order to make this a live journal you must everyone have at least a dollar interest in it every year. When statements are sent out or when you are asked to renew your subscription let's see the alumni check up one hundred per cent. The undergraduates do it and you can't afford to let them beat you out.

And another thing: We can't make this your journal unless we know where you are and what you are doing. Let the editor hear from you and keep in touch with him at all times. He will be glad to write you a personal letter about things in general and things in particular if you will let him. We want to carry articles from you in every issue. So take a few minutes off occasionally and write THE CHEMIST about yourself.

An employment committee has also been organized, the duty of which is to keep in touch with the industries and the available openings for good men. With your aid this committee can do a great work and succeed in placing Carolina men on top. Let us know of anything in this line.

Recent Discoveries in Chemistry by the Freshmen

Oxygen is colorless, odorless, tasteless, and gasless.

In weighing matter we measure the earth's circumference.

Ozone has a peculiar smell. O plus ozone gives oxidizone.

A chemical compound when mixed cannot be put in iron for it will eat it.

A theory is small particles of mass made up into a preparation.

The kinetic theory of gases is that all gases are made out of microes.

Law of pressures=14.185 times the weight of air.

Zn+Na Oh=Zn+H.

Zn+Heat=Zincate+H.

The reducing action of hydrogen is the action which causes it to seek a higher level.

A mixture are two substances mixed together.

O+Ozone=AgNo3.

A compound is a mixture of powdered solids whereas a mixture is a mixture of liquids.

Water is the national drink of America.

When the action of hydrogen is reduced and has not the action it normally has we call it the reducing action. The Kipp generator is an example of hydrogen being reduced.

High School Department

We are glad to announce that the competitive examination held in chemistry last March was a success. Miss Mamie Lee Chambers of Greensboro made the highest grade. Mr. Winborne Thompson of Winston-Salem was second and Mr. Harry Andrews of Tarboro carried off third place. All of the papers were good and showed evidence of serious effort on the part of the pupils and their teachers as well. In accordance with the conditions of the contest Mr. Thompson was awarded the medal as he was the only one of the contestants to enter the University this year. The results seem to warrant a repetition of the contest this year.

We wish to thank the principals and the teachers of all the schools which entered the contest for their co-operation. We hope to have their support again this year and in return will be glad to render them any assistance in their work possible.

The plan for co-operative buying of laboratory supplies as announced in the March number of THE CHEMIST will be elaborated as the demands of the schools require. This plan will be of very great service to the schools of the State when they once adopt it. Further announcement will be made at a later date by individual letter to the schools.

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Dr. J. M. Bell, Professor of Physical Chemistry.

Dr. J. T. Dobbins, Associate Professor of Chemistry.

Mr. I. W. Smithey, Instructor in Chemistry.

Mr. I. V. Giles, Instructor in Chemistry.

Mr. H. M. Taylor, Instructor in Chemistry.

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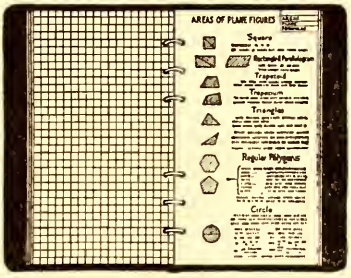

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